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Massachusetts Cranberry Weed Management: A 2009 Grower Survey of Problematic Weeds and Use of Flame Cultivation

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Weeds present a significant threat to cranberry yields, and management of weeds is a major priority for cranberry growers. Dewberry (*Rubus spp.*), sawbrier (*Smilax spp.*), and dodder (*Cuscuta spp.*) are three problematic weeds found in Massachusetts cranberry production. They are rated as “Priority 1” weeds, meaning they substantially reduce yields, spread quickly, and kill cranberry vines (Else, et al., 1995). Current weed management strategies for these weeds include cultural controls such as flooding, mechanical controls such as hand weeding, and chemical control with the use of herbicides. However, none of these options are particularly effective.

Along with the need to find more effective ways to manage weeds, there is an increasing interest to find ways to reduce chemical inputs into agriculture. The search for non-herbicidal alternatives to manage weeds in cranberry production is motivated by safety concerns relating to food residues and environmental issues, chemical costs, and a short list of approved chemicals for use on cranberries.

Flame cultivation (FC) is a method of weed control where target plants are exposed to brief periods of high temperature to damage or kill plant tissue. Various flame cultivation methods have been successfully used in annual crops such as carrots, corn, onions and potatoes as both pre-emergence and post-emergence (Diver, 2002). FC is being investigated as a possible method of controlling weeds on cranberry bogs (Ghantous et al., 2010).

A survey was developed and distributed to the Massachusetts cranberry grower community with the goal of gaining information about current weed problems, experience with traditional control methods, past experience using open burning or torches to control weeds, and willingness to incorporate flame cultivation into management practices if research indicates it is an effective technique.

The survey had 7 questions with multiple parts, and was handed out to 219 cranberry growers on January 22, 2009 at the Annual UMass Extension Research Update Meeting, and to an additional 18 growers at a makeup meeting held on March 16, 2009. A total of 118 surveys were used to compile the following results (50% response rate).

General demographic information

The survey data indicated that 69% (N=115) of MA cranberry growers were 50 years or older. Only 3.5% reported being under 30 years of age, and less than 9% reported being between the ages of 30-39. Eighteen percent were between 40-49 years.

Those growers (N=103) who indicated that they were the primary decision maker for bog acreage represented approximately 6,493 acres of cranberry production in Massachusetts (14,000 acres are estimated to be in production in the state). Half of the decision maker respondents owned/managed 16 acres or less; 78% owned/managed 50 acres or less. One-tenth of primary decision maker respondents reported they managed more than 100 acres (with a maximum of 1800 acres).

Weed presence and prevalence

Growers were asked about the presence of dewberry, sawbrier, and dodder on their bogs (117 responded). Dewberry was present on 80% of bogs, sawbrier on 72%, and dodder on 97%.

Growers (N=107) were asked to estimate the percentage of acreage affected by these weeds (category = 0%, <5%, 5-25%, 25-75%, or >75%) (Fig. 1). The largest group of growers reported having 5-25% of bog acreage affected by dewberry (corresponding responses to categories: 22%, 20%, 41%, 16%, 2%). The responses for sawbrier were similar (N=107), showing the largest group of growers had 5-25% of acres affected by sawbrier. Very few had more than 25% of acres affected; no growers reported having more than 75% affected by sawbrier (responses corresponding to categories: 31%, 27%, 36%, 6%, 0%). Only 3% of growers (N=103) reported having no acreage affected by dodder, and 30% had more than 25% of acreage affected by dodder (responses corresponding to categories: 3%, 14%, 53%, 21%, 9%).

Difficulty of control, and efficacy rating of current weed control options

Growers were also asked for their opinion on the level of difficulty for controlling dewberry, sawbrier, and dodder. For all three weeds, at least 50% of growers with that weed type present rated it “very difficult to control”, while only 10% or less found these weeds not difficult to control (Fig. 2).

Growers were asked about their use of current industry standard methods to control each weed species, and then to rate the level of effectiveness of that control against the target weed. Results will be presented as: (treatment) (% very effective, % somewhat effective, % not effective). Overall, the majority felt current controls for these three weeds were not effective or only somewhat effective (Figs. 3, 4, and 5).

Dewberry control methods evaluated were mesotrione (Callisto) (N=73; 8%, 84%, 8%), glyphosate (Roundup) (N=76; 15%, 65%, 21%), digging out (N=56; 20%, 48%, 32%), clipping (N=52; 4%, 37%, 60%), and floods (N=40; 3%, 33%, 65%). Callisto and Roundup were the most popular choices for dewberry control, although most growers rated them as somewhat effective. Most respondents felt that clipping and flooding were not effective controls.

Sawbrier control methods evaluated were Callisto (N=63; 19%, 67%, 14%), Roundup (N=78; 18% 64%, 18%), digging out (N=45; 24%, 44%, 31%), and clipping (N=47; 0%, 40%, 60%). Callisto and Roundup were also the most popular choices for sawbrier control, however the majority of growers using these controls rated them as only somewhat effective. No growers reported clipping to be a very effective method for controlling sawbrier.

Dodder control methods evaluated were dichlobenil (Casoron) (N=90; 27%, 67%, 7%), Callisto (N=61; 12%, 72%, 16%), hand removal (N=72; 17%, 56%, 28%), raking (N=59; 3%, 59%, 37%), and floods (N=41; 12%, 27%, 61%). Casoron and hand removal were used by the largest number of growers for dodder control. Of the 90 respondents using Casoron, 27% found it very effective and 67% found it somewhat effective. Seventy two respondents rated hand removal, with 17% finding it very effective and 56% finding it somewhat effective. Most growers felt that floods were not effective for dodder control.

Past experience using fire/heat to control weeds

Growers were asked if they ever used fire or heat to control weeds in the past, what portion of the farm was treated (e.g., bog, dike, ditch), and what specific application technique was used (open burning, torch designed for weed control, or other). Only 18% (N=20) reported having had experience with flame cultivation. Eleven growers had past experience using torches, while 6 respondents had used open burning.

Growers were asked to write in what weeds they were targeting with FC, and to rate the control as very effective, somewhat effective, or not effective.

FC was used on bogs with torches by 4 growers who identified their targets as narrow leaf goldenrod (*Euthamia tenuifolia*), asters (*Aster* sp.), sawbrier, and all weeds in general. Three growers found the control to be somewhat effective on all weeds and narrow leaf goldenrod, and one grower reported it to be very effective on all weeds.

FC was used to control weeds on bog dikes by 15 growers; 6 used torches and 7 used open burning, and 2 did not report which method they used. FC on dikes was used to control sawbrier, narrow leaf goldenrod, all weeds in general, and to remove mowing debris. Four growers found the technique to be very effective (all weeds in general). Six people found it somewhat effective against all weeds in general and sawbrier. Three people reported it to be not effective in controlling weeds (but they did not specify which weeds they were targeting).

Six growers had experience using FC in ditches against all weeds in general, rushes (*Juncus* spp.) grasses, and pitchforks (*Bidens frondosa*). Five of these growers evaluated the control as being very effective, and one did not rate the control.

Future incorporation of FC into weed management practices

Growers were asked how likely they would be to use hand-held flame cultivators for weed control if it was shown to be effective against dewberry, sawbrier, and dodder (Fig. 6). Growers seemed to be more likely to employ FC for dewberry and sawbrier than for dodder. This is likely due to the lack of any suitable control for the woody perennial weeds compared to the ability to use preemergence and postemergence herbicides for dodder control.

The vast majority of growers had no experience with FC, and many were hesitant to use it in general on any weed. Results from ongoing research by the authors using FC on cranberry, dewberry, sawbrier, and dodder were presented at the 2010 Annual UMass Extension Research Update Meeting, one year after the survey was completed. Data indicated that cranberry vines recovered from initial injury with FC as well as giving some measure of dewberry control. Although a second survey was not done at this time, there was verbal interest expressed by cranberry growers that showed increased willingness to try FC on their farms in the upcoming season. The use of hand-held flame cultivators holds promise for the control of certain weeds in cranberry and may be especially important for organic cranberry farmers.

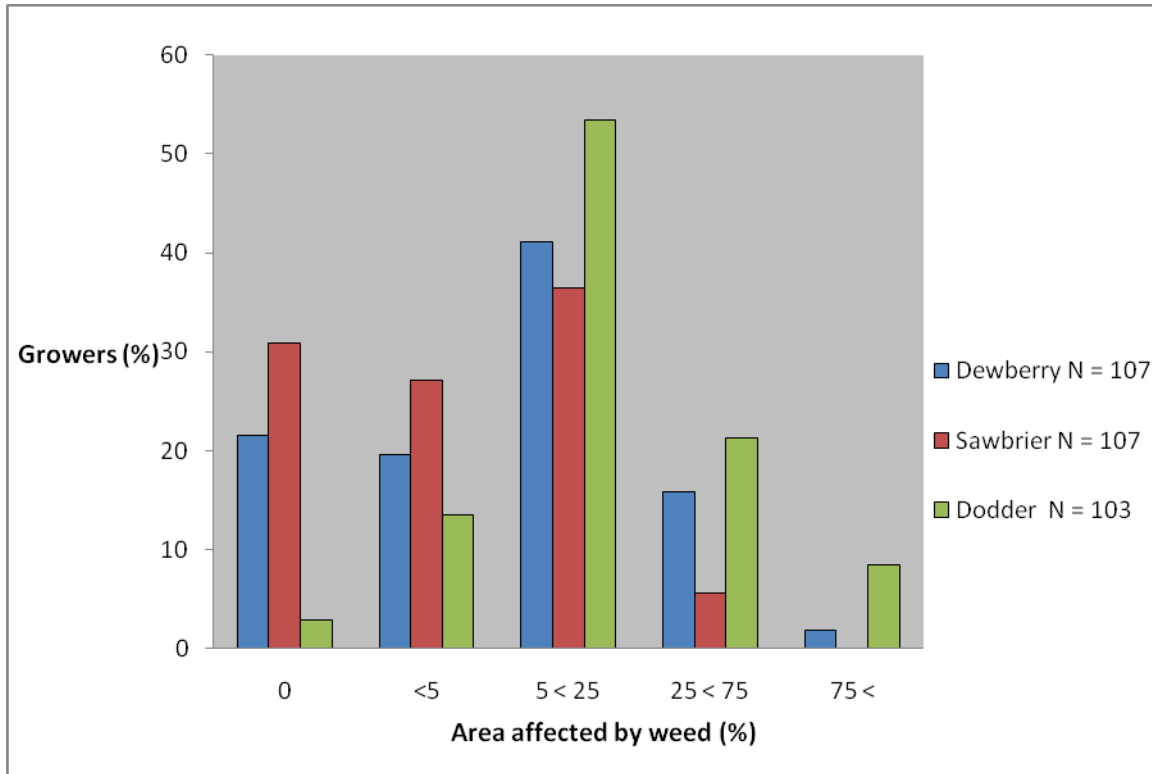


Figure 1. 2009. Percentage of Massachusetts cranberry growers who reported various percentages of their farms that were affected by dewberry, sawbrier, or dodder. N is the number of growers who gave information on each weed.

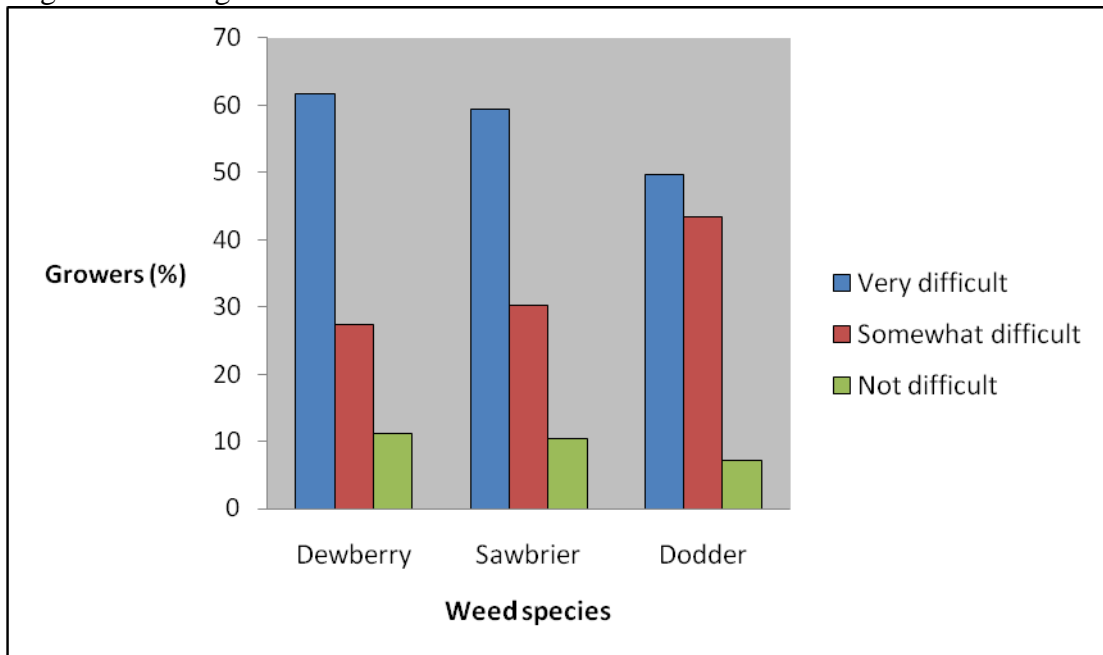


Figure 2. 2009. Percentage of Massachusetts cranberry growers who rated dewberry, sawbrier, and dodder as very difficult, somewhat difficult, or not difficult to control. N=116.

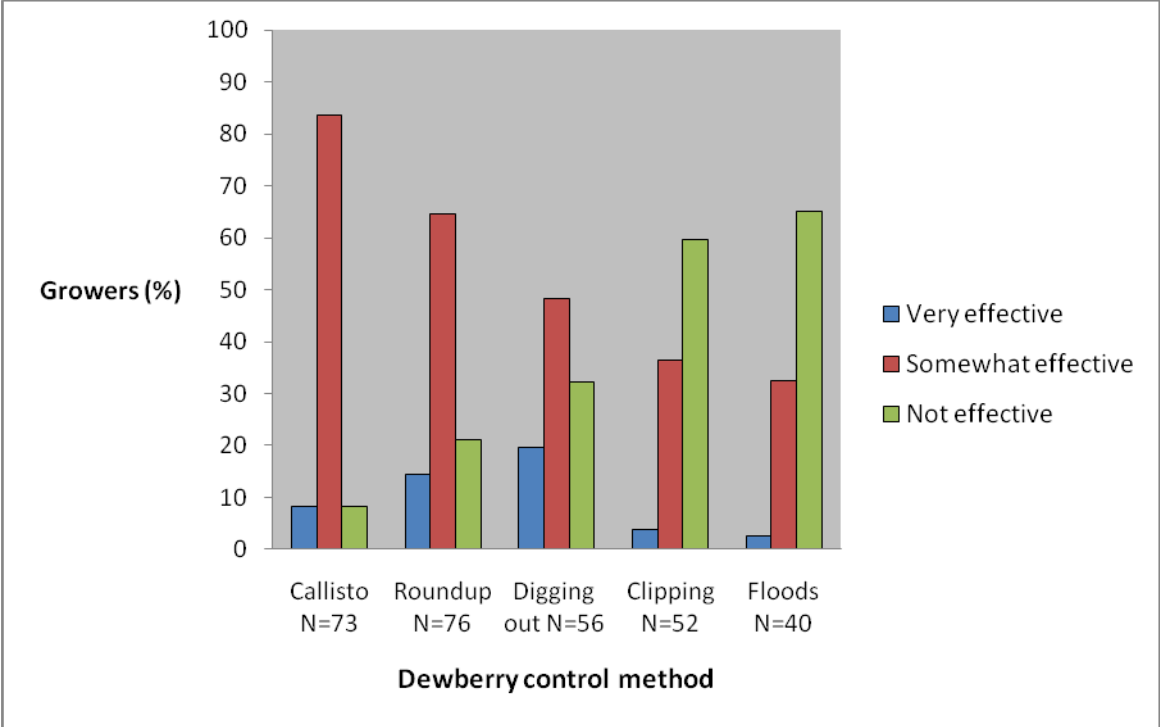


Figure 3. 2009. Percentage of Massachusetts cranberry growers who rated each industry standard dewberry control method as very effective, somewhat effective, or not effective.

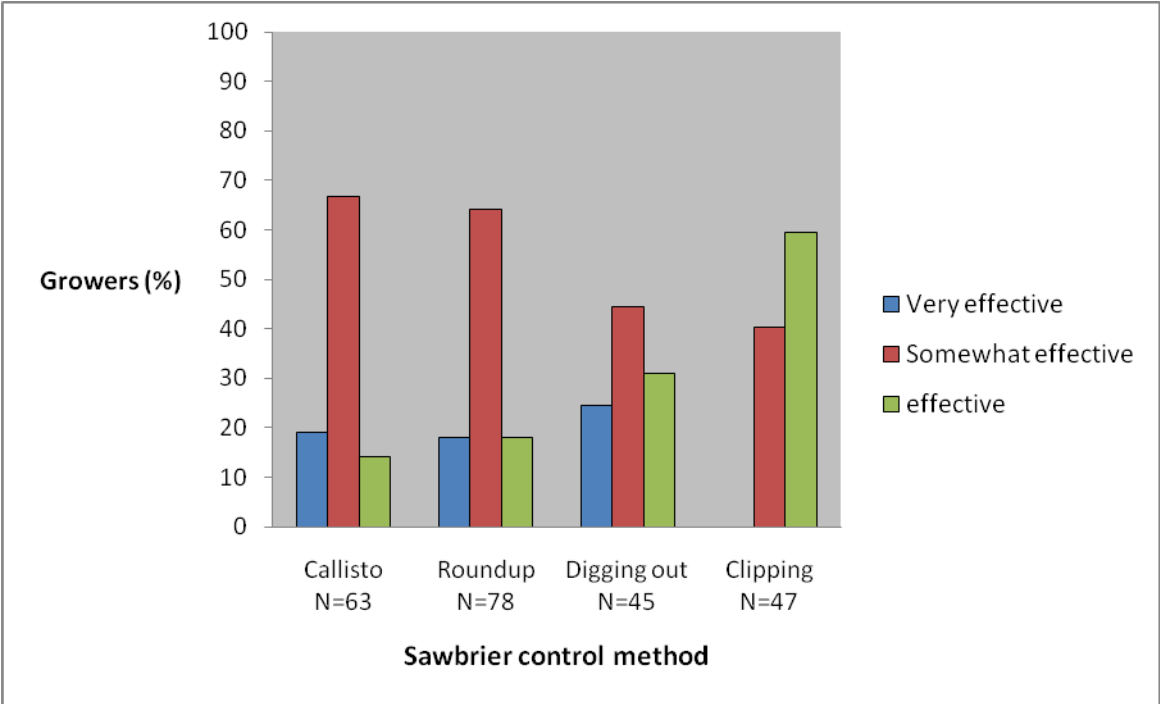


Figure 4. 2009. Percentage of Massachusetts cranberry growers who rated each industry standard sawbrier control method as very effective, somewhat effective, or not effective.

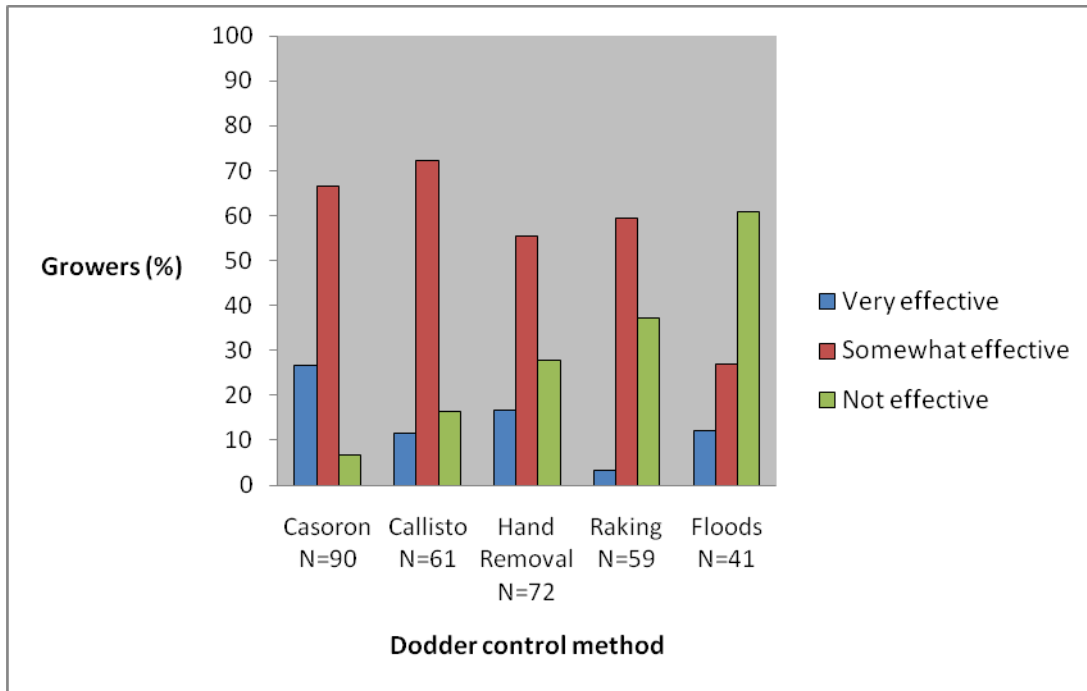


Figure 5. 2009. Percentage of Massachusetts cranberry growers who rated each industry standard dodder control method as very effective, somewhat effective, or not effective.

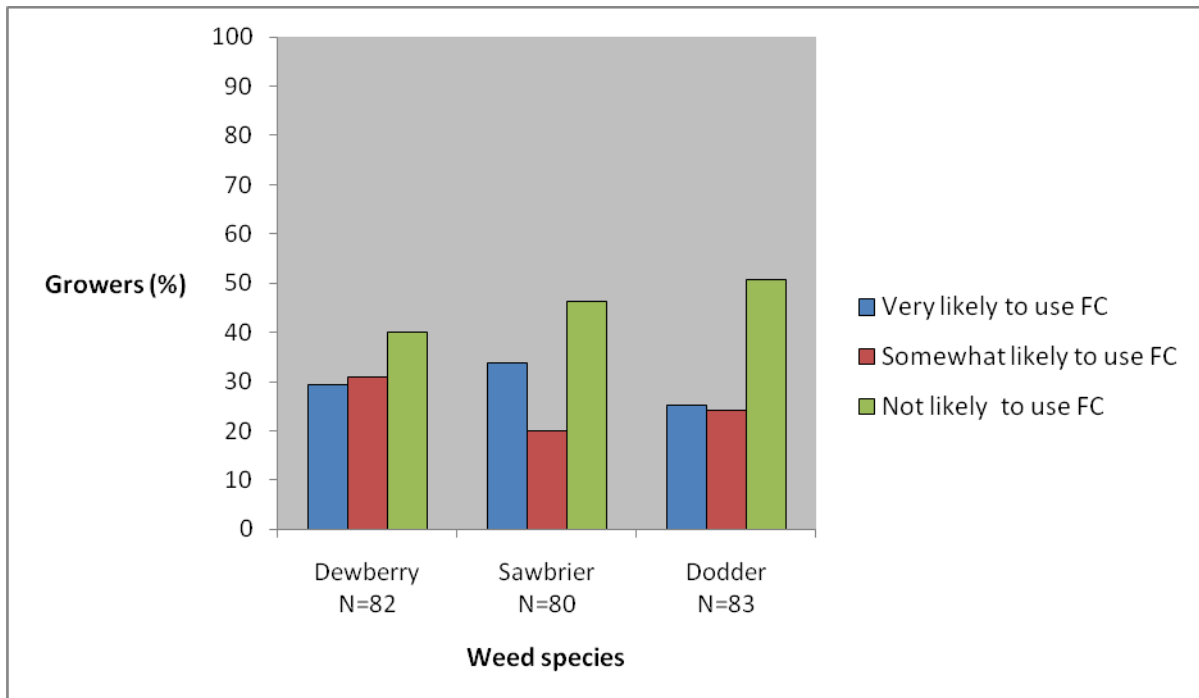


Figure 6. 2009. Percentage of Massachusetts cranberry growers who responded that they were very likely, somewhat likely, or not likely to use flame cultivation as a control method if proven to be effective on dewberry, sawbrier, and dodder.

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